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ABSTRACT

The program guide for autotronics (electronics mechanic) courses in Florida identifies primary considerations for the organization, operation, and evaluation of a vocational education program. Following an occupational description for the job title for electronics mechanic (including communication technician and electronics technician), and its Dictionary of Occupational Titles code are six sections providing: (1) a description of program content, including a curriculum framework, student performance standards, major concepts, and laboratory activities; (2) program implementation information, such as teacher characteristics, student admission criteria, cooperation education program description, and student organizations; (3) 34 resources listed by performance standards; (4) information on facility design; (5) a list of suggested equipment related to student performance standards; and (6) information on teacher professional development resources and organizations. The attached Career Merit Achievement Plan (Career MAP) for autotronics charts the competencies required for entry into the field of automotive electronics. It was developed to display the student performance standards required by the local education agencies and to document the level of achievement on student performance standards that individual students demonstrate. (KC)

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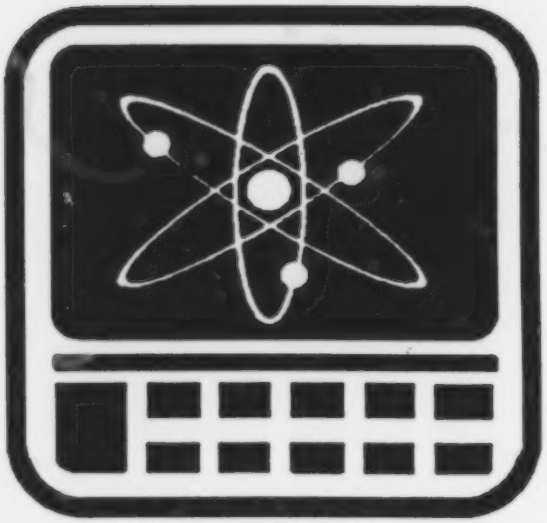

FLORIDA VOCATIONAL PROGRAM GUIDE FOR AUTOTRONICS

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INTRODUCTION

Vocational education meets the needs of students desiring to pursue a selected vocation and is designed to provide training that is realistic in meeting present and future employment opportunities. In recent years, applications of science and technology have expanded rapidly, increasing the education and training required of workers. This has made vocational training programs more attractive as an educational option. The new technologies require well-trained workers to carry out both standardized and specialized procedures, and whose training foundations have given them the capacity to keep pace with continuing technology demands.

The Florida Department of Education shares with business and industry the determination to provide opportunities for upward mobility to as many Floridians as possible. Vocational training programs can keep pace with the demands of new industrial patterns and can provide the opportunity for many of our citizens to gain financial stability and an improved sense of self worth. Therefore, it is necessary to create exemplary vocational programs and to make those programs consistent throughout the state.

This Program Guide identifies primary concerns that should be considered in the organization, operation and evaluation of a vocational education program. It has been developed to provide useful information to local school district and community college administrators, instructors, program advisory committees, regional coordinating councils and others charged with the responsibility of offering vocational education programs.

OCCUPATIONAL DESCRIPTION

A principle occupational title is identified for each vocational training program. This title is validated by the United States Department of Labor Dictionary of Occupational Titles (DOT) or other appropriate references. Such references may be the United States Department of Commerce Standard Occupational Classification Manual (SOC), the Occupational Employment Statistics Survey Dictionary (OES), or Vocational Preparation and Occupations (VPO) prepared by the National and State Occupational Information Coordinating Committees. Due to the rapid advances in automotive technology since publication of the above documents, job title and description for the burgeoning automotive technician field is not yet published. Information obtained from industry advisory committees was used to validate the occupational description. The job title for this program is listed in the curriculum framework which accompanies this guide.

D.O.T. JOB TITLE	D.O.T. CODE
ELECTRONICS MECHANIC	828.281-010

The definition (description) for this job title was taken from the D.O.T. for easy reference. (It is standard in the high-technology industries to use the term "technician" rather than "mechanic".)

> ELECTRONICS MECHANIC (any ind.) communication technician; electronics-equipment mechanic; electronics specialist; electronics-system mechanic; electronics technician.
>
> Repairs electronic equipment, such as computers, industrial controls, radar systems, telemetering and missile control systems, transmitters, antennas, and servomechanisms, following blueprints and manufacturers' specifications, and using handtools and test instruments: Tests faulty equipment and applies knowledge of functional operation of electronic units and systems to diagnose cause of malfunction. Test electronic components and circuits to locate defects, using oscilloscopes, signal generators, ammeters, and voltmeters. Replaces defective components and wiring and adjusts mechanical parts, using handtools and soldering iron. Alines, adjusts, and calibrates equipment according to specifications. Calibrates testing instruments. Maintains records of repairs, calibrations, and tests. May install equipment in

industrial or military establishments and in aircraft and missiles. May operate equipment, such as communication equipment and missile control systems in ground and flight tests, and be required to hold license from governmental agency. May be designated according to type of equipment repaired.

PROGRAM CONTENT

The Division of Vocational, Adult, and Community Education, as required by State Board of Education (**S.B.E.**) **Rule 6A-6.0571**, publishes Vocational Education Program Courses Standards annually. This document specifies the minimum program content for the operation of a vocational training program for the occupational titles listed. Each program identified in the Florida Department of Education Course Code Directory is required to establish course standards. The standards for each vocational offering are comprised of two major components: (1) Curriculum Framework and (2) Student Performance Standards.

Curriculum Framework (CF)

The Curriculum Framework specifies the exact course title, course number, levels of instruction, major course content, laboratory activities, special notes, major course concepts and intended outcomes. The program requirements stipulated in the curriculum framework have been approved by the State Board of Education and are the legal bases for delivery of instruction.

Student Performance Standards (SPS)

The Student Performance Standards are a resource list of job-specific competencies. This list is generated and approved by industry experts and becomes the basis for curriculum development in vocational programs. Local school districts and community colleges must, by law, adopt student performance standards for their vocational programs. They may, at their discretion, adopt the list provided or develop their own as long as there is sufficient content to address each intended outcome. A program may provide instruction beyond the minimum specified in the SPS if desired. The decision to do this should be based on local industry needs. However, the minimum must be presented.

The SPS for secondary level programs contain a third component, course structure. This component specifies the number of courses required for program completion and the content of each course. The courses may be taught in any sequence, but the content may not be changed unless approved by the Division of Vocational, Adult, and Community Education.

The curriculum framework and student performance standards are intended for use as a guide, not a teaching tool. Teachers or curriculum development personnel are expected to develop or select complete curriculum materials for their training programs based on the curriculum framework and student performance standards. Each intended outcome and SPS should be thoroughly analyzed for related cognitive and procedural subskills. The curriculum framework and student performance standards are presented in the following pages.

PROGRAM CONTENT AUTOTRONICS

CURRICULUM FRAMEWORK

FLORIDA DEPARTMENT OF EDUCATION

PROGRAM AREA: Industrial

EFFECTIVE DATE: July, 1993

PROGRAM TITLE: Autotronics

CODE NUMBER: Secondary _____ Postsecondary I470614

Florida CIP 0647.060401

SECONDARY SCHOOL CREDITS___ COLLEGE CREDITS___ POSTSECONDARY ADULT VOCATIONAL CREDITS___

APPLICABLE LEVEL(S): ___7-9 ___9-12 Postsecondary Adult Vocational__x__

___Postsecondary Vocational __x__Other__30, 31__

CERTIFICATION COVERAGE: ELECTRONIC @ 7G AUTO ELECT @ 7G

I. MAJOR CONCEPTS/CONTENT: The purpose of this program is to prepare students for initial employment as autotronics technicians (620.261-010). This program also provides supplemental training for persons previously or currently employed in this occupations.

This program includes selected competencies of the common core electronics program and others uniquely automotive.

The course content will include the following: direct current (DC); alternating current (AC), analog, relay, delay and time delay circuits; solid-state and digital devices, distribution, timing and control systems; microprocessors; industrial power supplies; transformers; DC and AC motors; digital motor controls; manual controllers; magnetic controllers and starters; pressure and strain measurements; temperature, photoelectric liquid level a process control; line diagrams and logic functions; gas and humidity sensing; and telemetry.

The course content should also include training in communication skills, leadership skills, human relations and employability skills, and safe efficient work practices.

II. LABORATORY ACTIVITIES: Shop or laboratory activities are an integral part of this program. These activities provide instruction in the use of tools, equipment, materials and processes found in the industry. Students will use various types of precision test equipment for analyzing, troubleshooting and repairing computer circuitry.

III. SPECIAL NOTE: The Vocational Industrial Clubs of America, Inc., is an appropriate vocational student organization which reinforces classroom instruction by providing communications, leadership, human relations and employability training skills. When provided, these activities are considered an integral part of this instructional program.

The cooperative method of instruction may be utilized for this program. Whenever the cooperative method is offered, the following is required for each student: a training plan, signed by the student, teacher and employer which includes instructional objectives and a list of on-the-job and in-school learning experiences; and a work station which reflects equipment, skills and tasks relevant to the occupation the student has chosen as a career goal. The student must receive compensation for work performed.

Algebra is recommended as a prerequisite for entry into this program.

In accordance with Section 233.0695 F.S., the minimum basic skills grade level required for this postsecondary adult vocational program is: Mathematics 10.0, Language 9.0, Reading 10.0. This grade level number corresponds to a grade equivalent score obtained on a state designated basic skills examination.

The typical length of this program for the average achieving student including the core is 1800 hours. This program provides the specialized technical content for the Automotive Service Management Technology (Autotronics Endorsement).

IV. INTENDED OUTCOMES: After successfully completing this program, the student will be able to:

01.0 Demonstrate a working knowledge of laboratory practices.
02.0 Demonstrate a working knowledge of direct current circuits.
03.0 Demonstrate a working knowledge of alternating current circuits.
04.0 Demonstrate a working knowledge of dual trace oscilloscopes.
05.0 Demonstrate a working knowledge of semi-conductor devices.
06.0 Demonstrate a working knowledge of integrated circuits.
07.0 Demonstrate a working knowledge of digital circuits.
08.0 Demonstrate a working knowledge of microprocessor fundamentals.
09.0 Demonstrate a working knowledge of electronic engine controls.
10.0 Demonstrate a working knowledge of electronic control module input and output devices and their functions.
11.0 Demonstrate a working knowledge of troubleshooting electronic control module systems.
12.0 Demonstrate a working knowledge of system operation.
13.0 Demonstrate a working knowledge of system input devices.
14.0 Demonstrate a working knowledge of system output devices.
15.0 Demonstrate a working knowledge of system diagnosis and repair.
16.0 Demonstrate a working knowledge of computer output displays.
17.0 Demonstrate a working knowledge of electronic instrumentation systems.
18.0 Demonstrate a working knowledge of theft deterrent systems.
19.0 Demonstrate a working knowledge of trip computer and trip monitor systems.
20.0 Demonstrate a working knowledge of windshield wiper and washer systems.
21.0 Demonstrate a working knowledge of cruise control systems.
22.0 Demonstrate a working knowledge of voice alert systems.
23.0 Demonstrate a working knowledge of audio systems.
24.0 Demonstrate a working knowledge of guide-matic and twilight sentinel systems.
25.0 Demonstrate a working knowledge of climate control systems.
26.0 Demonstrate a working knowledge of electronic seats with memory.
27.0 Demonstrate a working knowledge of fiber optics.
28.0 Demonstrate a working knowledge of automatic brake systems operation.
29.0 Demonstrate a working knowledge of anti-lock brake system diagnosis and repair.
30.0 Demonstrate a working knowledge of electronic level control systems.
31.0 Demonstrate a working knowledge of electronic steering systems.
32.0 Demonstrate a working knowledge of electronically controlled charging systems.
33.0 Demonstrate a working knowledge of driveability lab.

STUDENT PERFORMANCE STANDARDS EFFECTIVE DATE: July, 1993

PROGRAM AREA: Industrial Education SECONDARY NUMBER: _____

PROGRAM TITLE: Autotronics POSTSECONDARY NUMBER: I470614

01.0 DEMONSTRATE A WORKING KNOWLEDGE OF LABORATORY PRACTICES--The student will be able to:

01.01 Apply proper Occupational Safety Health Administration safety standards.
01.02 Make electrical connections.
01.03 Identify and use hand tools properly.
01.04 Identify and use power tools properly.
01.05 Demonstrate acceptable soldering and desoldering techniques.
01.06 Identify components of computer system consisting of central processing unit, monitor, keyboard, data storage devices and peripherals.
01.07 Initialize computer and operate keyboard.

02.0 DEMONSTRATE A WORKING KNOWLEDGE OF DIRECT CURRENT CIRCUITS--The student will be able to:

02.01 Solve problems in electronic units utilizing metric prefixes.
02.02 Relate electricity to the nature of matter.
02.03 Identify sources of electricity.
02.04 Define voltage, current, resistance, power and energy.
02.05 Read and interpret color codes and symbols to identify electrical components and values.
02.06 Measure properties of a circuit using volt-ohm meter and digital volt-ohm meter meters and oscilloscopes.
02.07 Apply Ohm's law to series circuits.
02.08 Construct and verify operation of series circuits.
02.09 Analyze and troubleshoot series circuits.
02.10 Apply Ohm's law to parallel circuits.
02.11 Verify the operation of parallel circuits.
02.12 Analyze and troubleshoot parallel circuits.
02.13 Apply Ohm's law to parallel circuits.
02.14 Construct and verify the operation of combination circuits.
02.15 Troubleshoot combination circuits.
02.16 Describe magnetic properties of circuits and devices.
02.17 Determine the physical and electrical characteristics of capacitors and inductors.

03.0 DEMONSTRATE A WORKING KNOWLEDGE OF ALTERNATING CURRENT (AC) CIRCUITS -- The student will be able to:

03.01 Identify properties of an AC signal.
03.02 Identify AC sources.
03.03 Analyze and measure AC signals utilizing VOM, DVM, oscilloscope, frequency counter and function generator.
03.04 Define the characteristics of AC capacitive circuits.
03.05 Define the characteristics of AC inductive circuits.
03.06 Define basic motor theory and operation.
03.07 Define basic generator theory and operation.

04.0 DEMONSTRATE A WORKING KNOWLEDGE OF DUAL TRACE OSCILLOSCOPES -- The student will be able to:

04.01 Demonstrate proper operation and use of dual trace oscilloscope.

05.0 DEMONSTRATE A WORKING KNOWLEDGE OF SEMI-CONDUCTOR DEVICES -- The student will be able to:

05.01 Overview of semi-conductor materials.
05.02 List types of diodes.
05.03 Explain application operation and characteristics of diodes.
05.04 explain construction,applications and use of silicon controlled rectifiers.
05.05 Describe transistor construction.
05.06 Explain characteristics of PNP/NPN transistors.
05.07 Measure current flow and calculate amplifier gain.
05.08 Explain construction and use of Darlington pair.
05.09 Explain concept of open collector operation.
05.10 Identify and define operating characteristics and applications of junction diodes.
05.11 Construct, analyze and troubleshoot diode circuits (basic breadboard).
05.12 Identify and define operating characteristics and applications of bipolar transistors.
05.13 Identify and define operating characteristics and applications of field effect transistors.
05.14 Identify and define operating characteristics and applications of single-stage amplifiers.
05.15 Construct, analyze and troubleshoot single-stage amplifiers.

06.0 DEMONSTRATE A WORKING KNOWLEDGE OF INTEGRATED CIRCUITS -- The student will be able to:

06.01 Identify and define operating characteristics and applications of linear integrated circuits.
06.02 Construct linear integrated circuits.
06.03 Analyze and troubleshoot linear integrated circuits.
06.04 Identify and define operating characteristics and applications of power supply regulator circuits.
06.05 Explain positive logic concepts.
06.06 Explain Schmidt trigger concept.
06.07 Explain invertor concepts.
06.08 Explain logic gates.
06.09 Explain quad driver and its use.
06.10 Analyze and troubleshoot power supply regulator circuits.
06.11 Identify and define operating characteristics and applications of opto-electronic devices.
06.12 Set up and operate measuring instruments for analog circuits and computer's diagnosis of auto system (emphasis volt meter).

07.0 DEMONSTRATE A WORKING KNOWLEDGE OF DIGITAL CIRCUITS -- The student will be able to:

07.01 Set up and operate logic probes for digital circuits.
07.02 Identify types of logic gates and their truth tables.
07.03 Construct combinational logic circuits using integrated circuits.
07.04 Analyze types of flip-flops and their truth tables.
07.05 Troubleshoot flip-flops.
07.06 Identify, define and measure characteristics of integrated circuit (IC) logic families.
07.07 Identify types of registers and counters.
07.08 Identify types of memory circuits.
07.09 Relate the uses of digital-to-analog and analog-to-digital conversions.
07.10 Troubleshoot digital-to-analog and analog-to digital circuits.
07.11 Identify types of digital displays.

07.12 Construct digital display circuits.
07.13 Troubleshoot digital display circuits.

08.0 DEMONSTRATE A WORKING KNOWLEDGE OF MICROPROCESSOR FUNDAMENTALS -- The student will be able to:

08.01 Explain fundamentals of microprocessor operation.
08.02 Analyze and measure properties of analog and digital signals utilizing VOM, DVM and oscilloscope.
08.03 Describe differences between analog and digital signals.
08.04 Explain type of memory(s).
08.05 Explain central processing unit operation.
08.06 Describe function of clock generator.
08.07 Explain function of analog to digital and digital to analog convertors (interface).
08.08 Explain binary code.
08.09 Explain pulse width modulation (duty cycle).
08.10 Explain sensor information processing.
08.11 Explain serial/parallel data processing.
08.12 Describe function of multiplexing.

09.0 DEMONSTRATE A WORKING KNOWLEDGE OF ELECTRONIC ENGINE CONTROLS -- The student will be able to:

09.01 Describe stoichiometric air/fuel ratio.
09.02 Describe computer control of air fuel ratio using concept of open loop/closed loop.
09.03 Describe adaptive memory, integrator, block learn.
09.04 Describe effect of air/fuel ratio, timing and exhaust gas recirculating system operation.
09.05 Describe function of three-way catalyst.
09.06 Describe methods of controlling air/fuel ratio.

10.0 DEMONSTRATE A WORKING KNOWLEDGE OF ELECTRONIC CONTROL MODULE INPUT AND OUTPUT DEVICES AND THEIR FUNCTIONS -- The student will be able to:

10.01 Demonstrate an understanding of the operation and use of dual trace oscilloscope.
10.02 Describe temperature sensor operation.
10.03 Describe manifold and barometric sensors operation.
10.04 Describe exhaust gas oxygen sensor operation.
10.05 Describe switch and timer circuit operation.
10.06 Explain construction and operation of Hall effect switch.
10.07 Perform testing of Hall effect switches.
10.08 Describe engine speed sensor operation.
10.09 Describe vehicle speed sensor(s) operation.
10.10 Describe throttle position sensor operation.
10.11 Perform testing of electronic timing controls including knock sensor.
10.12 Utilize oscilloscope to test pick-up coil, Hall-effect switch, EST circuits, reference circuits.
10.13 Describe detonation control (electronic spark control).
10.14 Demonstrate an understanding of electronic spark timing operation.
10.15 Describe mass airflow sensor operation.
10.16 Describe electronic control module control of fuel evaporative system.
10.17 Describe crankshaft position sensor operation.
10.18 Describe electronic control module control of air-management system.
10.19 Describe electronic control module control of early fuel evaporation (EFE).

10.20 Describe electronic control module control of spark timing.
10.21 Describe electronic control module control of carbureated fuel mixture.
10.22 Describe type of fuel injection systems.
10.23 Describe components of throttle-body injection systems.
10.24 Describe components of port fuel injection systems.

11.0 DEMONSTRATE A WORKING KNOWLEDGE OF TROUBLESHOOTING ELECTRONIC CONTROL MODULE SYSTEMS -- The student will be able to:

11.01 Describe procedures for troubleshooting electronic control module systems.
11.02 Describe type and use of trouble code(s).
11.03 Demonstrate use of generic and manufacturers' test equipment.
11.04 Describe difference between hard failure/soft failure.
11.05 Perform trouble code retrieval procedures.
11.06 Perform pin-out check on electronic control module input and output devices.
11.07 Remove/replace electronic control module/calibration unit.
11.08 Demonstrate ability to troubleshoot electronic control module systems utilizing manufacturers' diagnostic charts.
11.09 Demonstrate general knowledge of electronic systems for major imports.

12.0 DEMONSTRATE A WORKING KNOWLEDGE OF SYSTEM OPERATION -- The student will be able to:

12.01 Explain the operation of computer shifted automatic transmission systems.
12.02 Explain viscous converter clutch.
12.03 Describe control module's effect on shifting patterns.
12.04 Explain the function and operation of engine load sensors.

13.0 DEMONSTRATE A WORKING KNOWLEDGE OF SYSTEM INPUT DEVICES -- The student will be able to:

13.01 Explain neutral safety/backup light switch.
13.02 Explain throttle position sensor (potentiometer).
13.03 Explain vehicle speed sensor.
13.04 Explain function of brake release switch.
13.05 Explain engine coolant temperature sensor.
13.06 Explain function of air conditioning pressure switches.
13.07 Explain cold inhibit switch.
13.08 Explain operation of vacuum switches.
13.09 Explain thermal vacuum valve.
13.10 Explain vacuum regulator valve.
13.11 Explain vehicle speed sensor tripper module.

14.0 DEMONSTRATE A WORKING KNOWLEDGE OF SYSTEM OUTPUT DEVICES -- The student will be able to:

14.01 Explain operation of valve body/solenoid valve.
14.02 Explain function of gear switches.
14.03 Explain torque converter clutch apply valve.
14.04 Explain torque converter clutch delay valve.
14.05 Explain engine coolant fan temperature switch.
14.06 Explain governor pressure control switch.
14.07 Explain function of pulse relay.

15.0 DEMONSTRATE A WORKING KNOWLEDGE OF SYSTEM DIAGNOSIS AND REPAIR -- The student will be able to:

15.01 Describe system check.
15.02 Diagnose and differentiate between mechanical and electrical problems.
15.03 Diagnose shifting problems related to engine performance.
15.04 Identify driver habits effecting engine/transmission related diagnosis.
15.05 Describe stored code removal.

16.0 DEMONSTRATE A WORKING KNOWLEDGE OF COMPUTER OUTPUT DISPLAYS -- The student will be able to:

16.01 Describe, diagnose and repair service engine lights/emission lights.
16.02 Describe, diagnose and replace liquid crystal displays.
16.03 Describe, diagnose and replace vacuum tube fluorescent displays.
16.04 Describe, diagnose and repair/replace electronic speedometer system.
16.05 Describe, diagnose, and replace quartz-electric cluster.
16.06 Describe, diagnose and replace digital cluster.
16.07 Describe, diagnose and repair/replace odometer.

17.0 DEMONSTRATE A WORKING KNOWLEDGE OF ELECTRONIC INSTRUMENTATION SYSTEMS -- The student will be able to:

17.01 Explain electronic instrumentation.
17.02 Diagnose and replace light emitting diode.

18.0 DEMONSTRATE A WORKING KNOWLEDGE OF THEFT DETERRENT SYSTEMS -- The student will be able to:

18.01 Describe theft deterrent system operation.
18.02 Diagnose and repair the theft deterrent system

19.0 DEMONSTRATE A WORKING KNOWLEDGE OF TRIP COMPUTER AND TRIP MONITOR SYSTEMS -- The student will be able to:

19.01 Describe trip computer and trip monitor operations.
19.02 Diagnose and repair trip computer and trip monitor.

20.0 DEMONSTRATE A WORKING KNOWLEDGE OF WINDSHIELD WIPER AND WASHER SYSTEMS -- The student will be able to:

20.01 Describe windshield wiper and washer system operation.
20.02 Diagnose and repair trip computer and trip monitor.

21.0 DEMONSTRATE A WORKING KNOWLEDGE OF CRUISE CONTROL SYSTEMS -- The student will be able to:

21.01 Describe cruise control operation.
21.02 Diagnose and repair cruise control system.

22.0 DEMONSTRATE A WORKING KNOWLEDGE OF VOICE ALERT SYSTEMS -- The student will be able to:

22.01 Describe voice alert system operation.
22.02 Diagnose and replace audio system components.
22.03 Perform on-car adjustment of audio system.

23.0 DEMONSTRATE A WORKING KNOWLEDGE OF AUDIO SYSTEMS -- The student will be able to:

23.01 Describe radio system operation.
23.02 Diagnose and replace audio system components.
23.03 Perform on-car adjustments of audio system.

24.0 DEMONSTRATE A WORKING KNOWLEDGE OF GUIDE-MATIC AND TWILIGHT SENTINEL SYSTEMS -- The student will be able to:

24.01 Describe the dimmer system operation.
24.02 Diagnose and repair guide-matic and twilight sentinel systems.
24.03 Perform on-car adjustment of guide-matic and twilight sentinel systems.

25.0 DEMONSTRATE A WORKING KNOWLEDGE OF CLIMATE CONTROL SYSTEMS -- The student will be able to:

25.01 Describe operation of climate control systems.
25.02 Diagnose and repair electronic system.
25.03 Perform on car adjustment of system

26.0 DEMONSTRATE A WORKING KNOWLEDGE OF ELECTRONIC SEATS WITH MEMORY -- The student will be able to:

26.01 Describe operation of memory system.
26.02 Diagnose and repair electronic seats.
26.03 Perform on-car adjustment of system.

27.0 DEMONSTRATE A WORKING KNOWLEDGE OF FIBER OPTICS -- The student will be able to:

27.01 Theory of fiber optics.
27.02 Application of fiber optics.
27.03 Describe and identify fiber optic systems.
27.04 Diagnose and repair fiber optic systems.

28.0 DEMONSTRATE A WORKING KNOWLEDGE OF AUTOMATIC BRAKE SYSTEMS OPERATION -- The student will be able to:

28.01 Describe two-wheel and four-wheel anti-lock brake systems.
28.02 Identify anti-lock brake system components, electrical circuits and controls.
28.03 Explain brake modulation.
28.04 Explain built-in diagnosis on anti-lock brake system control module.
28.05 Explain use and location of skid control sensor.
28.06 Describe, diagnose and replace control module, if equipped.

29.0 DEMONSTRATE A WORKING KNOWLEDGE OF ANTI-LOCK BRAKE SYSTEM DIAGNOSIS AND REPAIR -- The student will be able to:

29.01 Perform basic diagnosis and testing using manufacturers' test equipment.
29.02 Diagnose problems with master cylinder, hydraulic booster, electric pump accumulator and valve body assembly.
29.03 Diagnose problems with fluid level warning switches.
29.04 Test electronic wheel sensors.
29.05 Perform system self diagnostic test.
29.06 Perform trouble code diagnostic procedures using manufacturers' diagnostic charts.

29.07 Perform pin-out checks.
29.08 Describe, diagnose and replace control module if equipped.

30.0 DEMONSTRATE A WORKING KNOWLEDGE OF ELECTRONIC LEVEL CONTROL SYSTEMS--The student will be able to:

30.01 Describe operation of electronic leveling control system.
30.02 Demonstrate the correct vehicle raising and lowering operation.
30.03 Explain the air replenishment system.
30.04 Describe a height adjuster sensor.
30.05 Perform diagnostic procedures using manufacturers' diagnostic charts.
30.06 Perform electrical circuit diagnosis.
30.07 Test system for correct performance.
30.08 Test compressor operation.
30.09 Test height sensor operation.
30.10 Test compressor current draw.
30.11 Test residual pressure.
30.12 Test system for air leaks.
30.13 Describe, diagnose and replace control module if equipped.

31.0 DEMONSTRATE A WORKING KNOWLEDGE OF ELECTRONIC STEERING SYSTEMS--The student will be able to:

31.01 System operation.
31.02 System diagnosis and repair.

32.0 DEMONSTRATE A WORKING KNOWLEDGE OF ELECTRONICALLY CONTROLLED CHARGING SYSTEM--The student will be able to:

32.01 System operation.
32.02 System diagnosis and repair.

33.0 DEMONSTRATE A WORKING KNOWLEDGE OF DRIVEABILITY LAB--The student will be able to:

33.01 Demonstrate a knowledge of current technology in electronic engine control systems.
33.02 Interpret vehicle identification numbers.
33.03 Perform comprehensive engine performance analysis using oscilloscope and other appropriate equipment.
33.04 Perform a diagnostic circuit check of on-board microprocessor systems (self-test).
33.05 Define and determine open and closed loop system operation.
33.06 Explain and service an air injection system.
33.07 Explain and service thermal systems.
33.08 Explain and service charcoal canister purge systems.
33.09 Service pollution control valve systems.
33.10 Service exhaust gas-type fuel evaporative systems.
33.11 Service electric type fuel evaporative systems.
33.12 Explain, diagnose and demonstrate the servicing of the service exhaust gas recirculating systems.
33.13 Test vacuum switch.
33.14 Test solenoid operated vacuum switch.
33.15 Service and repair engine cooling fan systems.
33.16 Perform non-scan tool tests on inputs and controls of microprocessor systems.
33.17 Perform scan tool diagnostics on inputs and controls of microprocessor systems.
33.18 Test, service and repair microprocessor input sensors and control devices.

33.19 Demonstrate the use of manufacturers' diagnostic charts.
33.20 Perform system performance checks on electronic engine control systems.
33.21 Diagnose cold driveability problems.
33.22 Diagnose warm driveability problems.
33.23 Perform sensor adjustment.
33.24 Perform exhaust gas backpressure test.
33.25 Check and reset ignition timing and idle speed settings as per vehicle emission control information label.
33.26 Perform internal and external adjustments on electronic carburetors.
33.27 Test and adjust minimum air flow.
33.28 Analyze exhaust gases for proper emissions.
33.29 Test electronic idle air control.
33.30 Check idle stop solenoid.
33.31 Repair circuits with the use of wiring diagrams and component locator manuals.
33.32 Perform field repairs to wiring and connectors.
33.33 Test and service electronic ignition systems.
33.34 Test and service anti-detonation (knock sensor) devices.
33.35 Perform pin out tests and interpret readings.
33.36 Check engine vacuum systems for proper routing and connections.
33.37 Service air inlet systems.
33.38 Test and/or replace ignition coils.
33.39 Demonstrate the procedure for electronic control module.
33.40 Perform diagnostic test on torque convertor clutch circuit and components.
33.41 Perform fuel pump pressure test on vehicles equipped with electronic fuel injection.
33.42 Test specific gravity of fuel, analyze and check for contaminants.
33.43 Perform fuel injector balance test on vehicles equipped with individual fuel injectors.
33.44 Perform fuel system diagnosis and performance checks.
33.45 Perform fuel pressure level tests.
33.46 Disassemble/reassemble throttle body unit.
33.47 Perform fuel injector cleaning procedures.
33.48 Test mass air flow sensor.
33.49 Remove, test, adjust and/or replace fuel injector.
33.50 Demonstrate understanding of system components.
33.51 Repair vehicles displaying various service codes as they would be encountered in a service situation.

PROGRAM IMPLEMENTATION

It is the teacher's responsibility to ensure that students learn how to competently perform the tasks specified in the course objectives. Therefore, the teacher must lead the students through the learning experiences in a course, motivate students, act as a role model for students, and at times, function as a guidance counselor and placement coordinator. This leadership role requires the teacher to participate in many of the activities required for program implementation. The teacher must select the methods of instruction that best apply to students' ability levels, measure student achievement and provide feedback. Key factors that must be considered when implementing this program are addressed below.

TEACHER CHARACTERISTICS

Subject Knowledge

The teacher must be a subject matter expert who is able to implement sound instructional methods and evaluate student performance. He/she must have significant work experience in the industry/vocational field and be able to communicate that knowledge to the students.

Instructional Delivery

The teacher's role in the learning process is to motivate and lead the student as well as impart subject matter knowledge. In order to maximize student learning, the use of a variety of instructional methods is encouraged. Because teaching styles vary greatly, teachers are highly encouraged to "pick and choose" from various methods or to combine methods for maximum benefit to students. Some of the more traditional methods used are lecture, demonstration and small group instruction. Other teaching methods which are suggested for further exploration include individualized self-paced, open-exit/open-entry, contract, computer based and competency based instruction. The focus of Competency Based Vocational Education (CBVE) is to ensure that each student can competently perform tasks specified before progressing to more complex skills.

CONVENTIONAL INSTRUCTIONAL METHODS

A vocational program may require a portion of the instruction to be presented in a standard lecture or controlled demonstration format. These methods of instruction can be easily combined with instructor controlled step-by-step practical exercises. Some instructional activities may dictate that this instructional approach be used to introduce students to hazardous equipment often utilized in vocational training. In most situations, students should be required to perform specified activities to achieve maximum skill competency. If mastery of a task is required, competency based education methods may be more appropriate. However, if the training activity involves an orientation or a seldom performed, non-essential task, conventional instructional methods may be more effective. Teachers are encouraged to use a variety of instructional methods to best meet instructional objectives.

Instructional Development

Teachers often must develop and select their own teaching and curriculum materials. In developing a comprehensive curriculum, instructional objectives based upon both the performance and cognitive domain must be included. When developing curriculum materials, teachers must use the curriculum framework (CF) and student performance standards (SPS) contained in this program guide as a basis. These materials delineate minimim program content which must be presented for an approved vocational training program. However, they are not intended for use as a comprehensive curriculum. Be certain not to adapt the curriculum to available materials, but select only those materials which can be adapted to the curriculum.

Instructional Measurement

Teachers must select testing methods that support the instructional delivery system used. Teachers must be competent to develop, administer and evaluate written and performance type tests.

Student Admissions Criteria

Providing the student the opportunity to successfully complete a vocational education program, in any institution, should be the primary concern of the instructional effort. Therefore, it is very important to direct planning and effort into identifying and selecting students with excellent potential for success in the educational program and in the occupation. The school's primary task is to prepare people for fulltime, entry-level positions as technicians or, in the case of those with more experience, as managers.

The Course Code Directory, specifies grade levels at which occupational programs are offered. Specific student admissions criteria which are required by the State and local educational agencies for the Autotronics training program are illustrated as follows.

SPECIFIC ADMISSIONS CRITERIA

Minimum Age:	As required by state and local policy
Physical Requirements:	None
Special Requirements:	None
Minimum Basic Skills Math Level:	* 10.0
Minimum Basic Skills Language Level:	* 9.0

* This grade level requirement is specified in the Curriculum Framework and is applicable to postsecondary level programs of 450 hours or more only. There is no minimum basic skill requirement for secondary programs.

THE STUDENT PROFILE

Developing a student profile is an important step in program implementation. Attention should focus on student characteristics that can be remediated within a training program, but could create serious impediments to success in the vocational field. Typical of these would be deficiencies in communication and mathematical skills. The basic skill levels can be measured by testing. Test results can then be used to direct the student to more suitable training which matches his or her skill level, or to determine supplemental training which may be required to increase chances for student success.

High school and postsecondary vocational students can be admitted to a vocational program upon request if they meet any specified prerequisites, such as physical or basic skill requirements. Training programs should be accessible to as many students as possible. Training programs are designed to prepare students for employment upon graduation, or serve as prerequisite to a postsecondary program.

The community college can be more selective and establish stringent admission standards. This may be done by assessing applicants or by recruiting potential students who meet the established prerequisite requirements of the training. The program advisory committee can design a profile of the potentially successful student. The profile should contain a

list of qualities, traits and aptitudes that will indicate a higher potential for student success. Acceptable levels for these traits must also be determined. For example, the qualities deserving highest attention, mechanical ability and cognitive aptitude, are those which the educational program itself will not likely be able to influence, although these traits should have considerable weight in establishing the basic profile. Deficiencies in mathematical or communication skills may lend themselves to improvement through related instruction while the student is enrolled in the program. The following example illustrates specific qualities to consider when establishing the student profile:

Mechanic/Technician--Service

- Knowledge of basic tools and equipment used by mechanics/technicians
- Ability to analyze and solve mechanical and technical problems
- Ability to interpret written mechanical/technical materials
- Ability to interpret mechanical/technical drawings
- Mechanical dexterity

Mechanic/Technical Service Management

- Basic application of service
- Business skills
- Ability to work with people
- Communication skills
- Leadership

QUALIFYING AND PRETESTING

Assessing potential students for vocational programs is an integral part of the recruiting process since considerable amounts of time and money will be spent on students entering training. Recruiters must have a good idea of the candidate's basic aptitude. Whoever guides the candidate to the program needs to have knowledge of the student's interests, abilities and experience. These can be measured by a variety of assessment methods, which should be performed upon program entry. The assessment can help determine extent and level of training each individual should receive.

The minimim basic skills requirement for mathematics and language skills is specified on the curriculum framework. Assessment should determine the level at which the student can read, write, calculate mathematics and understand the English language. It is appropriate for the program advisory committee and the school to develop some selection criteria based on minimum skill levels. These criteria should remain flexible in order to maximize educational opportunity for all applicants. Additionally, vocational educators must make every effort to serve the variety of "special needs" students and to eliminate sex-bias and stereotyping in all occupational areas.

ADVISORY COMMITTEE

It is imperative that representatives of industry be organized into an advisory committee. Constantly changing technological demands of our society will continue to stimulate changing industrial patterns. Therefore, effective use of program advisory committees is vital to the successful implementation of vocational training programs. Advisory committees provide expert technical advice which is not easily obtainable elsewhere, offer external support of policies and have tremendous public relations potential.

The most effective advisory committees are those whose members have mutual respect for each other's abilities and vested interest in the training program because of their need for trained workers. The program advisory committee is also one of the most effective means of facilitating placement. Its role can be:

- To contact local industry and encourage them to use the school's placement office as a means of filling jobs
- To develop an effective procedure for interviewing and evaluating potential employees suggested by the school
- To assist in gathering accurate and current job information as it becomes available

COUNSELING AND GUIDANCE

Counseling of students serves two purposes. It guides the student into the program and it supports enrolled students on a continuing basis throughout the program. Much day-to-day counseling will be the responsibility of the teacher. The teacher has the most contact with the student and is in a position to detect and correct a problem. Each student will encounter new problems as the program develops. The teacher's job is to work with the student to help identify problems and then strive for solutions. The teacher will provide much of the counseling that focuses on trade knowledge and skills.

The professional counselor cannot be expected to have the subject matter expertise of the primary teacher. The counselor, however, can focus on the student's needs related to other issues such as personal growth, interests and attitudes. The ideal situation will provide at least one counselor with current knowledge of industry standards for career counseling. A useful tool which should be used in the counseling process is the Career Merit Achievement Plan (Career MAP) which presents minimum instructional content keyed to student performance standards. Career MAPs are available for each industrial program area, and can be used to document student achievement, isolate student interests, talents and weaknesses. They are also useful for placement purposes. Information on Career MAPs may be obtained by contacting the Department of Education, Division of Vocational, Adult, and Community Education, (904) 488-0484.

STUDENT PLACEMENT

Implementing an effective placement system is integral to developing a successful vocational training program. **S.B.E. Rule 229.551 (3)(g)** requires 70 percent placement of students who have completed a vocational training program. Although placement is not always a problem, as with students already working in a related occupation, the placement program should place emphasis upon students who are seeking entry-level employment since these students have little or no experience with industry.

The task of the placement program is to locate job openings in the community. The placement coordinator or teacher must know each student's personal aims and interests in addition to the information stated on the achievement record. In many cases, teachers are the best source to match students to job openings because of their contacts with the industry advisory committee. Input concerning employment openings must come from individual business establishments in the community. The placement coordinator should introduce a student to as many suitable job openings as possible. Conversely, employers can then be expected to interview as many qualified candidates as possible.

Cooperative Education

COOPERATIVE EDUCATION APPLICABILITY

Normally, a student will complete the entire program as a full-time student before obtaining employment as an electronics technician. However, there may be situations where a student could be allowed to complete part of the program while employed as an electronics technician. At this time it is appropriate for the student to enroll in industrial cooperative education (ICE). Guidelines for this training plan are provided in the "Industrial Cooperative Education Program Guide," published by the Division of Vocational, Adult, and Community Education, Order # IE 508 BK 87.

Industrial cooperative education is a method of instruction designed to prepare students for jobs in the community. This method is a joint effort between the school and the business community. Student trainees receive a combination of instruction in the classroom and related on-the-job training through employment. Learning experiences are jointly planned and supervised by the teacher and the employer. Cooperative education is relevant to the needs of the student preparing for a work role, and will help the student to achieve success and personal satisfaction as the transition is made from school to the constantly changing world of work.

Cooperative education is defined in the Federal Register, Volume 39, number 143, Vocational Education, Section 102.96, as a program ". . . to prepare students for employment, through: (a) providing meaningful work experiences combined with formal education enabling students to acquire knowledge, skills, and appropriate attitudes, (b) removing the artificial barriers which separate work and education, (c) involving educators with employers, creating interaction whereby the needs and problems of both are made known, thereby making it possible for occupational curricula to be revised to reflect current needs in various occupations . . . ."

PURPOSE

Cooperative Education is for persons who, through written cooperative arrangements between the school and employers, receive instruction, including required academic courses and related instruction by alternation of study in school with a job in any industrial occupational field. These two experiences must be planned and supervised by the school and employers so that each contributes to the student's education and employability. Work periods and school attendance may be on alternative half days, full days, weeks or other periods of time to fulfill objectives of the cooperative education program.

GOALS AND OBJECTIVES

The primary goal of the cooperative method of vocational education is to prepare skilled, responsible individuals who can assume a productive role in the community. Specific objectives to meet the primary goal are:

- To prepare individuals for employment, adjustment and advancement in specified occupations or occupational areas (primary objective)
- To provide an understanding of the contribution of work to the social and economic welfare of our nation
- To provide students with an understanding and appreciation of the American free enterprise system
- To*p+25Xfoster an awareness of the civic, social and moral responsibilities of individuals to society

- To stimulate students' interest in their chosen occupational fields and provide an understanding of the opportunities in each field
- To provide training that results in increased efficiency in performing job tasks
- To provide curriculum which is sensitive and adaptable to changes in occupational practices and procedures as they are affected by societal, economic, technical and educational developments
- To strive to develop a greater appreciation of the value of specifically trained personnel among employers, employees and consumers
- To reinforce skills learned in the school laboratory
- To provide experiences on tools and equipment not available in the school laboratory
- To supplement and broaden the school curriculum into areas not otherwise available

Student Organization Participation

Vocational student organizations operate pursuant to federal and state laws, which authorize them as viable components of vocational education programs. According to federal regulations, the vocational education program of instruction may include activities of vocational student organizations which are an integral part of the vocational instruction offered and which are supervised by vocational education personnel. The **S.B.E.** Rules authorize vocational student organizations as an integral part of the vocational education program as stated in **S.B.E. 6A-6.064 (7)** and **6A-6.065 (8).**

VOCATIONAL INDUSTRIAL CLUBS OF AMERICA (VICA)

VICA is an organization for secondary or postsecondary students enrolled in trade and industrial education programs in high schools, area vocational technical centers and junior and community colleges. It is the only national and international organization for trade and industrial students. The organization is designed to expand and enrich opportunities for leadership, social awareness and civic responsibility in vocational students.

Students who participate in VICA activities are often better prepared for the world of work. They acquire knowledge of the many opportunities available in their chosen careers and become aware of the value of their

contributions to society. They are also given opportunities to develop and utilize their talents and abilities in ways that otherwise would not be available to them.

BENEFITS OF VICA MEMBERSHIP FOR THE STUDENT

Membership in VICA offers the student the opportunity for growth and development in the following areas:

School and Community Service Activities Students in VICA become involved in various school and/or community services. These may include clothing or food collections for the needy, donation of time and service to the elderly and participation in fund raisers or similar activities.

Social Interaction with Fellow Students Activities are also available that offer students time for relaxation and fun. Social activities of this type may be held on a regular basis. They might be held on the school campus during school hours, or off campus after school. More formal functions would include end of the year award banquets or industry/employer appreciation dinner banquets.

Competition in Skill and Leadership Contests VICA offers various contests in all the skill and leadership areas it serves. Often, teachers identify talented students who represent their school in regional competitions. However, any student member of VICA may compete. Instructors should conduct planned contests within their trade areas. This also pertains to leadership areas. First and second place regional winners then move on to the state level contest. The state winners then compete at the national level of the United States Skill Olympics.

INSTRUCTIONAL RESOURCES

STUDENT REFERENCE MATERIALS

Necessary instructional texts or pertinent material should be available for each student to satisfy training objectives. When textbooks are used, the copyright date should be as current as possible.

SERVICE MANUALS

Manuals with current manufacturer's service procedures and specifications should be available. These manuals must be located where students can use them while working in the shop area.

PERIODICALS

Current general and technical magazines and newspapers should be available for student and instructor use.

The following list of suggested resources is organized under each outcome shown in the curriculum framework. These resources have been recommended by instructors and program administrators.

01.0 DEMONSTRATE A WORKING KNOWLEDGE OF LABORATORY PRACTICES

TITLE, AUTHOR, ORDER#	PUBLISHER	TYPE
Modern Automotive Mechanics James Duffy	GOODHEART-WILLCOX COMPANY, INC.	
Basic Soldering for Electronics	PACE, INC.	video

02.0 DEMONSTRATE A WORKING KNOWLEDGE OF DIRECT CURRENT CIRCUITS

TITLE, AUTHOR, ORDER#	PUBLISHER	TYPE
Basic Electricity and DC Circuits Oliva & Dale	SAM'S	text
Chrysler Basic Electrical Video	CHRYSLER CORPORATION	video
GM Basic Electrical Video	GENERAL MOTORS CORPORATION	video
Inductors/Capacitors	BERGWALL PRODUCTIONS	video
Understanding Resistors #30	BERGWALL PRODUCTIONS	video

03.0 DEMONSTRATE A WORKING KNOWLEDGE OF ALTERNATING (AC) CIRCUITS

TITLE, AUTHOR, ORDER#	PUBLISHER	TYPE
Basic AC Circuits Fulton & Rawlings	SAM'S	text
Understanding DC Circuitry Patrick & Fardo	PRENTICE-HALL, Division of Simon & Schuster	text
AC Power Generation and Transmission	TEL-A-TRAIN	video

04.0 DEMONSTRATE A WORKING KNOWLEDGE OF DUAL TRACE OSCILLOSCOPES

TITLE, AUTHOR, ORDER#	PUBLISHER	TYPE

NO ADDITIONAL RESOURCES HAVE BEEN SUGGESTED

05.0 DEMONSTRATE A WORKING KNOWLEDGE OF SEMI-CONDUCTOR DEVICES

TITLE, AUTHOR, ORDER#	PUBLISHER	TYPE
Understanding Electricity & Electronics Patrick & Fardo	PRENTICE-HALL, Division of Simon & Schuster	text
Understanding Semiconductor Devices Patrick & Fardo	PRENTICE-HALL, Division of Simon & Schuster	text
Bipolar Transistor Fundamentals	ADVANCED MICROSYSTEMS TECHNOLOGY	video

Semiconductor Materials	TEL-A-TRAIN	video
Silicon Diodes	TEL-A-TRAIN	video
Transistors Semi Conductors and Diodes	TEL-A-TRAIN	video

06.0 DEMONSTRATE A WORKING KNOWLEDGE OF INTEGRATED CIRCUITS

TITLE, AUTHOR, ORDER#	PUBLISHER	TYPE
Integrated Circuits	TEL-A-TRAIN	video

07.0 DEMONSTRATE A WORKING KNOWLEDGE OF DIGITAL CIRCUITS

TITLE, AUTHOR, ORDER#	PUBLISHER	TYPE
Understanding Digital Electronics Patrick & Fardo	PRENTICE-HALL, Division of Simon & Schuster	text
Understanding Digital Electronics	BERGWALL PRODUCTIONS	video

08.0 DEMONSTRATE A WORKING KNOWLEDGE OF MICROPROCESSOR FUNDAMENTALS

TITLE, AUTHOR, ORDER#	PUBLISHER	TYPE
Automobile Electronics & Basic Electrical Systems Ken Layne ISBN 0-471-61763-6	JOHN WILEY & SONS, INC.	text
Computerized Engine Controls King ISBN 0-8273-4059-1	DELMAR PUBLISHING	text

09.0 DEMONSTRATE A WORKING KNOWLEDGE OF ELECTRONIC ENGINE CONTROLS

TITLE, AUTHOR, ORDER#	PUBLISHER	TYPE
Automotive Engine Performance Layne ISBN 0-471-82992-7	JOHN WILEY & SONS, INC.	text
Electronic Engine Controls King	DELMAR PUBLISHING	text
Computerized Engine Controls	GENERAL MOTORS CORPORATION	video

10.0 DEMONSTRATE A WORKING KNOWLEDGE OF ELECTRONIC CONTROL MODULE INPUT AND OUTPUT DEVICES AND THEIR FUNCTIONS

TITLE, AUTHOR, ORDER#	PUBLISHER	TYPE
Ford EEC IV Video	FORD MOTOR CORPORATION, GENERAL OFFICE	video

11.0 DEMONSTRATE A WORKING KNOWLEDGE OF TROUBLESHOOTING ELECTRONIC CONTROL MODULE SYSTEMS

TITLE, AUTHOR, ORDER#	PUBLISHER	TYPE
DRB II Testing Video	CHRYSLER CORPORATION	video
Ford Star Tester Video	FORD MOTOR CORPORATION, GENERAL OFFICE	video
GM Tech I Scanner	GENERAL MOTORS CORPORATION	video

12.0 DEMONSTRATE A WORKING KNOWLEDGE OF SYSTEM OPERATION

TITLE, AUTHOR, ORDER#	PUBLISHER	TYPE

NO ADDITIONAL RESOURCES HAVE BEEN SUGGESTED

13.0 DEMONSTRATE A WORKING KNOWLEDGE OF SYSTEM INPUT DEVICES

TITLE, AUTHOR, ORDER#	PUBLISHER	TYPE

NO ADDITIONAL RESOURCES HAVE BEEN SUGGESTED

14.0 DEMONSTRATE A WORKING KNOWLEDGE OF SYSTEM OUTPUT DEVICES

TITLE, AUTHOR, ORDER#	PUBLISHER	TYPE

NO ADDITIONAL RESOURCES HAVE BEEN SUGGESTED

15.0 DEMONSTRATE A WORKING KNOWLEDGE OF SYSTEM DIAGNOSIS AND REPAIR

TITLE, AUTHOR, ORDER#	PUBLISHER	TYPE

NO ADDITIONAL RESOURCES HAVE BEEN SUGGESTED

16.0 DEMONSTRATE A WORKING KNOWLEDGE OF COMPUTER OUTPUT DISPLAYS

TITLE, AUTHOR, ORDER#	PUBLISHER	TYPE
Electronic Instrumentation	FORD MOTOR CORPORATION, GENERAL OFFICE	text

17.0 DEMONSTRATE A WORKING KNOWLEDGE OF ELECTRONIC INSTRUMENTATION SYSTEMS

TITLE, AUTHOR, ORDER#	PUBLISHER	TYPE
Electronic Instruments Video	CHRYSLER CORPORATION	video

18.0 DEMONSTRATE A WORKING KNOWLEDGE OF THEFT DETERRENT SYSTEMS

TITLE, AUTHOR, ORDER#	PUBLISHER	TYPE
Pass Key Theft Deterrent System Manual	GENERAL MOTORS CORPORATION	text
Chrysler Theft System Video	CHRYSLER CORPORATION	video
Pass Key Video	GENERAL MOTORS CORPORATION	video

19.0 DEMONSTRATE A WORKING KNOWLEDGE OF TRIP COMPUTER AND TRIP MONITOR SYSTEMS

TITLE, AUTHOR, ORDER#	PUBLISHER	TYPE

NO ADDITIONAL RESOURCES HAVE BEEN SUGGESTED

20.0 DEMONSTRATE A WORKING KNOWLEDGE OF WINDSHIELD WIPER AND WASHER SYSTEMS

TITLE, AUTHOR, ORDER#	PUBLISHER	TYPE
NO ADDITIONAL RESOURCES HAVE BEEN SUGGESTED		

21.0 DEMONSTRATE A WORKING KNOWLEDGE OF CRUISE CONTROL SYSTEMS

TITLE, AUTHOR, ORDER#	PUBLISHER	TYPE
Chassis Electronic Systems Layne	DELMAR PUBLISHING	text

22.0 DEMONSTRATE A WORKING KNOWLEDGE OF VOICE ALERT SYSTEMS

TITLE, AUTHOR, ORDER#	PUBLISHER	TYPE
NO ADDITIONAL RESOURCES HAVE BEEN SUGGESTED		

23.0 DEMONSTRATE A WORKING KNOWLEDGE OF AUDIO SYSTEMS

TITLE, AUTHOR, ORDER#	PUBLISHER	TYPE
NO ADDITIONAL RESOURCES HAVE BEEN SUGGESTED		

24.0 DEMONSTRATE A WORKING KNOWLEDGE OF GUIDE-MATIC AND TWILIGHT SENTINEL SYSTEMS

TITLE, AUTHOR, ORDER# PUBLISHER	TYPE
NO ADDITIONAL RESOURCES HAVE BEEN SUGGESTED	

25.0 DEMONSTRATE A WORKING KNOWLEDGE OF CLIMATE CONTROL SYSTEMS

TITLE, AUTHOR, ORDER# PUBLISHER	TYPE
NO ADDITIONAL RESOURCES HAVE BEEN SUGGESTED	

26.0 DEMONSTRATE A WORKING KNOWLEDGE OF ELECTRONIC SEATS WITH MEMORY

TITLE, AUTHOR, ORDER# PUBLISHER	TYPE
NO ADDITIONAL RESOURCES HAVE BEEN SUGGESTED	

27.0 DEMONSTRATE A WORKING KNOWLEDGE OF FIBER OPTICS

TITLE, AUTHOR, ORDER# PUBLISHER	TYPE
NO ADDITIONAL RESOURCES HAVE BEEN SUGGESTED	

28.0 DEMONSTRATE A WORKING KNOWLEDGE OF AUTOMATIC BRAKE SYSTEMS OPERATIONS

TITLE, AUTHOR, ORDER# PUBLISHER	TYPE

NO ADDITIONAL RESOURCES HAVE BEEN SUGGESTED

29.0 DEMONSTRATE A WORKING KNOWLEDGE OF ANTI-BRAKE SYSTEM DIAGNOSIS AND REPAIR

TITLE, AUTHOR, ORDER# PUBLISHER	TYPE

NO ADDITIONAL RESOURCES HAVE BEEN SUGGESTED

30.0 DEMONSTRATE A WORKING KNOWLEDGE OF ELECTRONIC LEVEL CONTROL SYSTEMS

TITLE, AUTHOR, ORDER# PUBLISHER	TYPE

NO ADDITIONAL RESOURCES HAVE BEEN SUGGESTED

31.0 DEMONSTRATE A WORKING KNOWLEDGE OF ELECTRONIC STEERING SYSTEMS

TITLE, AUTHOR, ORDER# PUBLISHER	TYPE

NO ADDITIONAL RESOURCES HAVE BEEN SUGGESTED

32.0 DEMONSTRATE A WORKING KNOWLEDGE OF ELECTRONICALLY CONTROLLED CHARGING SYSTEM

TITLE, AUTHOR, ORDER# PUBLISHER	TYPE

NO ADDITIONAL RESOURCES HAVE BEEN SUGGESTED

33.0 DEMONSTRATE A WORKING KNOWLEDGE OF DRIVEABILITY LAB

TITLE, AUTHOR, ORDER# PUBLISHER	TYPE

NO ADDITIONAL RESOURCES HAVE BEEN SUGGESTED

FACILITIES

Facility Design Recommendations

Facilities, tools and equipment are essential parts of training programs, and must be designed to meet State program standard requirements and instructional objectives. This section of the Program Guide contains information for setting up classroom and laboratory facilities. Facility design criteria and space requirements are specified in **S.B.E. Section B, Chapter 6A-2**.

TEACHING FACILITIES

The instructional environment should duplicate, as closely as possible, the real-life work environment the student will enter after graduation. The more the school resembles the industrial environment, the easier it will be for the student to make the transition from school to work. Tools, supplies and equipment should conform to local industry standards. The teacher should actively pursue supplemental resources to expose the students to state-of-the-art equipment.

All facilities should include classroom space, as well as space for regular classroom equipment such as audio-visual equipment. Laboratory facilities should be equipped with work stations or workbenches, tables, chairs and special training aids to demonstrate basic principles and theory. They should contain enough tools and equipment to enable several students to work individually on the same learning activity.

UPDATING FACILITIES

To keep pace with technological changes and improvements, facilities must be updated on a continuing basis. When planning facilities, priority must be to provide space which will fulfill changing needs of the instructional program. Buildings should be designed with flexibility to expand in order to accommodate future program changes and to allow for greater ease of facility updating. The program advisory committee should be used to assist the school in establishing priorities for obtaining facilities, tools and equipment. Careful planning and analysis of current and future needs will lead to the establishment of an effective training environment.

SCHOOL FACILITIES

Autotronics

This section of the program guide provides guidelines for Autotronics program facilities. All vocational programs must meet additional facility requirements specified in **S.B.E. Section B, Chapter 6 A-2.**

The classroom/laboratory areas should be designed to accommodate oversized machinery, equipment, materials and holding tables. Each area should be equipped with special lighting, as necessary. The area should provide oversized openings equipped with service entry doors to the movement and transporting of oversized equipment, materials and products.

The laboratory should include electrical outlets providing 110 volts at each work station. Electrical outlets should be permanently mounted to the work station benches. Additional electrical outlets should be installed along the walls and in the center areas of the laboratory. Electrical outlets in the center areas should be mounted on posts between the ceiling and work stations or on pull down extension systems. Special electrical wiring may be required to supply the power requirements of specialized equipment. All electrical service must be installed according to local building code requirements.

CLASSROOM/LABORATORY FACILITIES

Space requirements for **new** facility construction for this program are specified in **S.B.E. Rule 6A-2.032** as shown below.

NEW FACILITIES
AUTOTRONICS

Occupant Design Stations	20
Net Square Feet Per Occupant	
Minimum	162
Normal	171
Maximum	180
Total Net Square Feet	
Minimum	3240
Normal	3420
Maximum	3600

WORK STATION ARRANGEMENT

The arrangement of work stations and specialized equipment depends upon the general layout of the facilities, but careful consideration must be given to convenience to entrances and exits, easy movement among work stations and tool/storage areas. The area should have a counter convenient to work stations. Overall layout of the facility should be planned so that the location of entrances and exits permits a logical flow of work in progress. One of the most critical factors in planning a facility is the arrangement of work stations to obtain a safe, efficient traffic pattern.

ADDITIONAL FACILITY CONSIDERATIONS

Training Stations

Training stations and live work areas must be available in the type and number required to meet program goals and performance objectives.

Instructional Area

A classroom or designated area of the laboratory should be available for lecture, instruction, viewing audio visual materials and other nonshop activities.

Personal Tool/Equipment Storage Area

A secure storage room or area should be provided, with enough shelf space for student supplies/tool boxes and floor space for equipment.

General Storage

Storage areas for tools, parts, supplies and machines must be sufficient to support the activities outlined in the program goals and performance objectives.

Office Space

An area separate from the classroom and laboratory should be available and convenient for use by the instructor(s) as an office.

Maintenance

A regular facilities maintenance program must be implemented to ensure that equipment and facilities are safe and usable to meet instructional needs.

Housekeeping

The classroom, laboratory and support area(s) must be kept clean and orderly.

Ventilation

A fume/dust removal system should be in place and operable. When appropriate, heating and cooling systems should be used to provide sufficient comfort for learning. Ventilation requirements are stated in **S.B.E. Rule 6A-2.066.**

First Aid

A first aid station must be in place, well marked and complete with appropriate supplies.

Support Facilities

Restrooms, clean-up areas and lockers convenient to the shop should be available for students.

Safety

The facilities must meet all Occupational Safety and Health Administration (OSHA) safety standards, where applicable.

Facility Evaluation

The program advisory committee should be asked to conduct an annual evaluation of the facilities to insure the program's continuing capability to meet instructional objectives.

Safety, Maintenance and Liability

SAFETY

S.B.E. Rule 6A-2.097

The Florida State Board of Education establishes rules for the operation of public schools. **Part III, Section B, Chapter 6A-2** of the State Board of Education Rules contains the standards for existing educational facilities. Subsections deal with the entire school facility in regard to such topics as electrical equipment, flammable materials, ventilation, fire safety, storage and illumination. Subsection 6A-2.097 contains safety regulations pertaining to vocational classes.

The statute requires 100 percent protection of every student and teacher participating in laboratory work wherein the type of activities listed in the statute above are conducted. This will include: demonstration by teachers or students, students and teachers present in a room or laboratory when students are engaged in make-up work or project work, and when anyone is using tools for construction or repair work involving the shaping or cutting of any solid materials.

Rules and regulations for an eye protection program should be organized and distributed to teachers, students and school personnel. Safety devices should be worn by those participating in the activity and by those who are observers or who may be in close proximity.

Marking of Hazardous Areas

Floors, walls, posts, stationary objects, machinery and equipment should be properly painted, marked, coded or identified, according to recommended safety practices of OSHA, the school board and industry.

Emergency Procedure For Injuries

The following procedures are recommended in the event of an injury or sudden illness in a student:

- Refer to the red "fire or medical emergency" signs posted in appropriate areas.
- Provide immediate first aid if so qualified.
- Notify appropriate personnel to advise them of the problem. They can also contact emergency trained personnel on campus.
- A conscious person has the right to refuse treatment and/or transportation to a medical facility.
- Advise students that they will be financially responsible for ambulance and emergency care.
- The paramedics will assume patient care upon arrival.
- If emergency transportation is not indicated, the student may spend time at the clinic, be allowed to go home or go to a medical facility.
- Be sure to complete the appropriate student injury form for any and all accidents or sudden illness.

MAINTENANCE

Schools should have the necessary facilities for routine maintenance. Special maintenance requirements for this program concern the hand and power tools and machines. Arrangements must be made to accomplish routine and non-routine maintenance of hand and power tools and cutting and shaping machines. Arrangements can be made through the school's shop or an outside agency.

VOCATIONAL TEACHER LIABILITY

Liability of Teacher and School Board

Negligence of vocational education teachers can cause unnecessary injury, and may result in teacher and school district liability. Vocational teachers are recommended to carry personal liability insurance. To reduce the risk of liability and injuries, the following suggestions are provided.

- Follow accepted policies of the school board.
- Do not allow students to use equipment or tools which have not been approved by the administration and Board of Education.
- Establish safety rules and enforce them.
- Do not leave the shop/laboratory while students are working.
- Do not permit non-enrolled students to use the shop/laboratory.
- Do not allow students to use machines or tools for which instruction has not been given.
- Do not approve unsupervised student activities inside or outside the shop/laboratory.
- Prepare accident forms for all accidents.
- Regularly inspect the workplace and equipment for defects or potential hazards and maintain documentation of unserviceable or hazardous items.
- Consider age, maturity, skill and ability of students when providing instruction and supervision.
- Administer safety tests to students upon completion of the demonstration of a specific machine, tool or process and keep documentation on file in your office.
- Require all students to wear eye protection devices, when appropriate, for laboratory activities.

SUGGESTED EQUIPMENT LIST

General Classroom Equipment

DESCRIPTION

Chalkboard

Bulletin board

Bookcases

Cabinet-storage

Student study stations

Audio-visual equipment as needed

Laboratory Tools and Equipment

These tools and items of equipment are normally used in this program. Equipment items are listed under each outcome, corresponding to the curriculum framework. Consumable supplies should be readily available to assure continuous instruction. Consumable supplies such as solder and wire are not contained in the equipment list.

Turnkey teaching system which includes:

Microcomputer and printer
Student training stations
Electronic boards

Demonstrators: Electronic fuel injection systems
Ignition systems

Simulators: Electrical power systems
Engine sensors & controls
Emission control systems
Electrical accessories

Auto force tester
Backpressure tester
Charging system tester
Computer harness adoptive
Curve tracer
Digital logic probe
Digital multimeter
Distributor tester
DRB tester
Dual trace oscilloscope
Dwell meter
Frequency counter
Fuel vapor tester
Fuel alcohol tester
Function generator
GM VCR training tapes
Impedence meter
Mass air flow tester
Multimeter
O.T.C. scanner (4000)
Oscilloscope
Pressure gages
Pro-link analyzers
Rework and repair stations
Soldering iron
Tachometer, analog
Tech I scanner with brake certification
Testers w/test supports
Timing light and meter
Volt Ohm meter, analog
Volt Ohm meter, digital

PROFESSIONAL DEVELOPMENT

Teacher Technical Updating

Technical updating workshops are scheduled periodically throughout the State, usually in the summer months. Teachers should take advantage of the opportunity to attend the automotive technology program technical update workshops when they are held. All instructional staff are encouraged to participate in as many training opportunities as possible.

Teachers should seek opportunities with local companies to maintain currency with industry trends. During periods when school is not in session, teachers are encouraged to make arrangements to return to industry for suitable involvement in their area of expertise.

Membership in professional associations offers vocational educators an enormous range of opportunities for working together to strengthen the field and to develop personal competence and satisfaction in work. The associations have similar goals and activities. They seek excellence in program content by means of joint efforts among members, communications that keep members current, forums for the discussion of issues in the field, useful and stimulating publications and sound professional growth experiences at local, state, regional and national meetings and annual conventions. They are concerned with increasing public understanding and support of the field. Teachers are encouraged to maintain affiliation with professional organizations. A list of professional organizations follows this section of the guide.

Teacher Standards

As a prerequisite to certification, teachers must have the required years of experience in the appropriate technical field as defined in the certification standards. For the Autotronics program, the requirements are six years continuous experience in automotive electronics maintenance. The teacher is then judged qualified to teach upon meeting one of the following criteria: (1) regular or temporary Florida teacher's certificate with appropriate coverage, (2) Approval of local school board consistent with adopted school policy or (3) regular or temporary Florida teacher's certificate with other than appropriate coverage (has met all occupational experience requirements prescribed as a prerequisite to appropriate certification and has been approved by the school board to teach

out-of-field). Refer to the Curriculum Framework for this program to determine the appropriate occupational specialization coverage required for certification.

Instructional staff must have technical competency and meet all State and local requirements for certification. Instructors should hold current, nationally recognized certification in the subject areas taught, if awarded. Beginning teachers must be enrolled in the State Beginning Teacher Program.

A systematic method of obtaining "substitute" instructors, approved by the school board, should be used to assure instructional continuity. An orientation session for substitutes should be held on a regular basis. The substitute should be a competent instructor in the occupational area and specific competencies taught.

Professional Organizations and Support Services

EDUCATION ORGANIZATIONS

AMERICAN VOCATIONAL ASSOCIATION (AVA)
1410 King Street
Alexandria, VA 22314
800-826-9972

FLORIDA ASSOCIATION FOR TRADE AND INDUSTRIAL EDUCATION, INC. (FATIE)
Florida Department of Education
Industrial Education - Vocational Division
Knott Building
Tallahassee, FL 32399
904-488-0484

FLORIDA VOCATIONAL ASSOCIATION (FVA)
1420 North Paul Russell Road
Tallahassee, FL 32399
904-878-6860

FLORIDA VOCATIONAL INDUSTRIAL CLUBS OF AMERICA (VICA)
Florida Department of Education
Knott Building
Tallahassee, FL 32399
904-488-0484

TRADE ORGANIZATIONS

This list contains trade associations and technical societies. Many offer training programs of some sort, either directly or through their member companies. Specific details should be requested in writing.

AUTOMOTIVE PARTS & ACCESSORIES ASSOCIATION
4600 East-West Highway
Bethesda, MD 20814
(301)654-6664

AUTOMOTIVE PARTS REBUILDERS ASSOCIATION
6849 Old Dominion Drive
McLean, VA 22101-9971
(703)790-1050

EQUIPMENT AND TOOL INSTITUTE
1545 Waukegon Road
Glenview, ILL 60025

MOBILE AIR CONDITIONING SOCIETY (MACS)
P.O. Box 97
East Greenville, PA 18041-0097
(215)541-4500

NATIONAL INSTITUTE FOR
AUTOMOTIVE SERVICE EXCELLENCE (ASE)
13505 Dulles Technology Drive
Herndon, VA 22701-3415
(703)742-3800

AUTOMOTIVE SERVICE INDUSTRY ASSOCIATION (ASIA)
444 N. Michigan
Chicago, ILL 60611-3903
(321)836-1300

IE 580 BK-93

CAREER MERIT ACHIEVEMENT PLAN (CAREER MAP)

AUTOTRONICS

(0647.060401)

STUDENT'S NAME

State of Florida

An affirmative action/equal opportunity employer

DEPARTMENT OF EDUCATION
Betty Castor, Commissioner of Education

DIVISION OF VOCATIONAL, ADULT AND COMMUNITY EDUCATION
Lanny Larson, Director

DEVELOPED BY:
University of South Florida
Department of Adult and Vocational Education

INDUSTRY-BASED PARTNERSHIP PROGRAMS: The State of Florida is committed to the development of industry-based partnership programs, designed by education and industry to respond to industry's demand for a highly skilled work force.

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E. H. Lampke, Ford Parts and Service
Dave Mays, Dave Mays Automotive

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If you have questions regarding program content,
please contact:

Bureau of Vocational, Adult and Community Education
Division of Vocational Adult and Community Education
Florida Department of Education
Florida Education Center
Tallahassee, FL 32399-0400

(904)488-1147

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55

THIS MERIT ACHIEVEMENT PLAN RECORDS THE AUTOTRONICS ACHIEVEMENTS OF:

Student's Name _____

Student ID Number _____

Student's Address _____

_____

Initial Instructor _____

School _____

Date Started _____

PRIMARY JOB TITLE(S) FOR AUTOTRONICS

- Electronics Mechanics (DOT#828.281-010)

Program completers qualify for the primary job title(s) listed above. Related job titles may be added based on those job titles found in industry and/or the Dictionary of Occupational Titles.

OVERVIEW

This Career MAP includes the competencies required for entry into the field of automotive electronics. Business and industry representatives have recommended that students in this field master these competencies in order to become employable. Local education agencies (LEAs) may adapt these competencies to meet their workforce needs.

PURPOSE OF THE MAP

The purposes of the MAP are: to display the student performance standards (SPS) required by the LEA and to document the level of achievement on student performance standards that the student demonstrates.

HOW TO USE THE MAP

Administrator and Instructor. The administrator and instructor can use Career MAPs in curriculum planning, program updating and improvement and teacher recruitment, selection and updating. If the LEA changes or adds student performance standards, the revised or additional student performance standards should be included in the blank boxes that appear within each intended outcome or at the end of this MAP.

Instructor. The instructor can use Career MAPs to keep track of student progress on student performance standards. By periodically reviewing the ratings on student performance standards, the instructor can identify a student's strengths and weaknesses and, on that basis, identify the skills for which the student needs remedial instruction or advanced training. The MAP can also be useful in student counseling and evaluation.

Co-op Instructor/Employer. The employer who sponsors a co-op program should use the Career MAP for keeping a record of the student's performance on appropriate standards. The MAPs will also help the co-op instructor/employer in counseling and evaluating the student.

Student. The student may use the MAP to show potential employers the performance standards he or she has mastered. In order to present a complete record, the student should encourage the instructor/co-op employer to rate his or her level of achievement on all the appropriate student performance standards and to fill in the verification form/cooperative work experience page in the back of this MAP.

Employer. The MAP shows an employer the student performance standards mastered by the student (a prospective employee) and the proficiency level achieved on each student performance standard. This information can help the employer make decisions about hiring, job assignments and job-training needs.

RATING STUDENT PERFORMANCE STANDARDS

Performance Competencies. Ratings on student performance standards should be based upon business/industrial performance standards. The evaluator observes and evaluates student performance as he or she would in the role of the employer or supervisor.

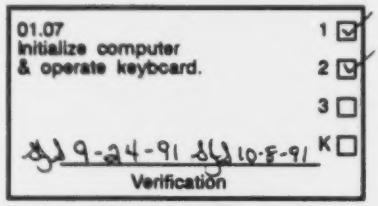
For each skill listed the learner receives a rating of 1, 2 or 3. Each rating indicates a particular level of achievement:

1 = Learner demonstrates knowledge and understanding of this student performance standard, but is not yet able to apply that knowledge or understanding.

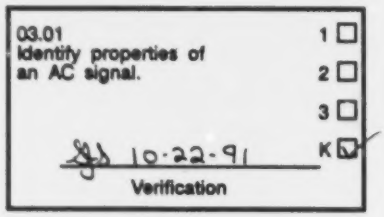
2 = Learner performs this student performance standard satisfactorily with only periodic supervision.

3 = Learner performs this student performance standard satisfactorily without supervision.

Whenever a performance standard is demonstrated, the instructor checks the appropriate rating box (1, 2 or 3) and initials and dates the verification line. If the student later demonstrates a higher level of achievement on a performance competency, the instructor checks the higher level and then enters his or her initials and the new date on the verification line, as shown in the following example:



Knowledge Competencies. For each SPS that is a knowledge competency only, with no manipulative skill involved, only one level of achievement is possible. If the student masters the competency, he or she receives a check in the bottom box ("K"), as shown below:



NOTE: A student performance standard without a checked rating indicates that the learner has not mastered the standard from lack of either ability, time, opportunity or need (the student's area of specialization may not have required it).

01.0 DEMONSTRATE A WORKING KNOWLEDGE OF LABORATORY PRACTICES.

01.01 Apply proper Occupational Safety Health Administration safety standards. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	01.02 Make electrical connections. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	01.03 Identify & use hand tools properly. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification
01.04 Identify & use power tools properly. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	01.05 Demonstrate acceptable soldering & desoldering techniques. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	01.06 Identify components of computer system consisting of central processing unit, monitor, keyboard, data storage devices & peripherals. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification
01.07 Initialize computer & operate keyboard. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification
1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification

02.0 DEMONSTRATE A WORKING KNOWLEDGE OF DIRECT CURRENT CIRCUITS.

02.01 Solve problems in electronic units utilizing metric prefixes. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	02.02 Relate electricity to the nature of matter. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	02.03 Identify sources of electricity. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification
02.04 Define voltage, current, resistance, power & energy. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	02.05 Read & interpret color codes & symbols to identify electrical components & values. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	02.06 Measure properties of a circuit using volt-ohm meter & digital volt-ohm meter meters & oscilloscopes. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification

AUTOTRONICS

02.07 Apply Ohm's law to series circuits. 1 2 3 K Verification	02.08 Construct & verify operation of series circuits. 1 2 3 K Verification	02.09 Analyze & troubleshoot series circuits. 1 2 3 K Verification
02.10 Apply Ohm's law to parallel circuits. 1 2 3 K Verification	02.11 Verify the operation of parallel circuits. 1 2 3 K Verification	02.12 Analyze & troubleshoot parallel circuits. 1 2 3 K Verification
02.13 Apply Ohm's law to series, parallel & combination circuits. 1 2 3 K Verification	02.14 Construct & verify the operation of combination circuits. 1 2 3 K Verification	02.15 Troubleshoot combination circuits. 1 2 3 K Verification
02.16 Describe magnetic properties of circuits & devices. 1 2 3 K Verification	02.17 Determine the physical & electrical characteristics of capacitors & inductors. 1 2 3 K Verification	1 2 3 K Verification
1 2 3 K Verification	1 2 3 K Verification	1 2 3 K Verification

03.0 DEMONSTRATE A WORKING KNOWLEDGE OF ALTERNATING CURRENT (AC) CIRCUITS.

03.01 Identify properties of an AC signal. 1 2 3 K Verification	03.02 Identify AC sources. 1 2 3 K Verification	03.03 Analyze & measure AC signals utilizing VOM, DVM, oscilloscope, frequency counter & function generator. 1 2 3 K Verification
03.04 Define the characteristics of AC capacitive circuits. 1 2 3 K Verification	03.05 Define the characteristics of AC inductive circuits. 1 2 3 K Verification	03.06 Define basic motor theory & operation. 1 2 3 K Verification

03.07 Define basic generator theory & operation. 1 2 3 K Verification	1 2 3 K Verification	1 2 3 K Verification
1 2 3 K Verification	1 2 3 K Verification	1 2 3 K Verification

04.0 DEMONSTRATE A WORKING KNOWLEDGE OF DUAL TRACE OSCILLOSCOPES.

04.01 Demonstrate proper operation & use of dual trace oscilloscope. 1 2 3 K Verification	1 2 3 K Verification	1 2 3 K Verification
1 2 3 K Verification	1 2 3 K Verification	1 2 3 K Verification

05.0 DEMONSTRATE A WORKING KNOWLEDGE OF SEMI-CONDUCTOR DEVICES.

05.01 Overview of semiconductor materials. 1 2 3 K Verification	05.02 List types of diodes. 1 2 3 K Verification	05.03 Explain application operation & characteristics of diodes. 1 2 3 K Verification
05.04 Explain construction, applications & use of silicon controlled rectifiers. 1 2 3 K Verification	05.05 Describe transistor construction. 1 2 3 K Verification	05.06 Explain characteristics of PNP/NPN transistors. 1 2 3 K Verification

05.07 Measure current flow & calculate amplifier gain. 1 2 3 K Verification	05.08 Explain construction & use of Darlington pair. 1 2 3 K Verification	05.09 Explain concept of open collector operation. 1 2 3 K Verification
05.10 Identify & define operating characteristics & applications of Autotronics - Continued junction diodes. 1 2 3 K Verification	05.11 Construct, analyze & troubleshoot diode circuits (basic breadboard). 1 2 3 K Verification	05.12 Identify & define operating characteristics & applications of bipolar transistors. 1 2 3 K Verification
05.13 Identify & define operating characteristics & applications of field effect transistors. 1 2 3 K Verification	05.14 Identify & define operating characteristics & applications of single-stage amplifiers. 1 2 3 K Verification	05.15 Construct, analyze & troubleshoot single-stage amplifiers. 1 2 3 K Verification
1 2 3 K Verification	1 2 3 K Verification	1 2 3 K Verification

06.0 DEMONSTRATE A WORKING KNOWLEDGE OF INTEGRATED CIRCUITS.

06.01 Identify & define operating characteristics & applications of linear integrated circuits. 1 2 3 K Verification	06.02 Construct linear integrated circuits. 1 2 3 K Verification	06.03 Analyze & troubleshoot linear integrated circuits. 1 2 3 K Verification
06.04 Identify & define operating characteristics & applications of power supply regulator circuits. 1 2 3 K Verification	06.05 Explain positive logic concepts. 1 2 3 K Verification	06.06 Explain Schmidt trigger concept. 1 2 3 K Verification
06.07 Explain invertor concepts. 1 2 3 K Verification	06.08 Explain logic gates. 1 2 3 K Verification	06.09 Explain quad driver & its use. 1 2 3 K Verification

06.10 Analyze & troubleshoot power supply regulator circuits. 1 2 3 K Verification	06.11 Identify & define operating characteristics & applications of optoelectronic devices. 1 2 3 K Verification	06.12 Set up & operate measuring instruments for analog circuits & computer s diagnosis of auto system (emphasis volt meter). 1 2 3 K Verification
1 2 3 K Verification	1 2 3 K Verification	1 2 3 K Verification

07.0 DEMONSTRATE A WORKING KNOWLEDGE OF DIGITAL CIRCUITS.

07.01 Set up & operate logic probes for digital circuits. 1 2 3 K Verification	07.02 Identify types of logic gates & their truth tables. 1 2 3 K Verification	07.03 Construct combinational logic circuits using integrated circuits. 1 2 3 K Verification
07.04 Analyze types of flip-flops & their truth tables. 1 2 3 K Verification	07.05 Troubleshoot flip-flops. 1 2 3 K Verification	07.06 Identify, define & measure characteristics of integrated circuit (IC) logic families. 1 2 3 K Verification
07.07 Identify types of registers & counters. 1 2 3 K Verification	07.08 Identify types of memory circuits. 1 2 3 K Verification	07.09 Relate the uses of digital-to-analog & analog-to-digital conversions. 1 2 3 K Verification
07.10 Troubleshoot digital-to-analog & analog-to-digital circuits. 1 2 3 K Verification	07.11 Identify types of digital displays. 1 2 3 K Verification	07.12 Construct digital display circuits. 1 2 3 K Verification
07.13 Troubleshoot digital display circuits. 1 2 3 K Verification	1 2 3 K Verification	1 2 3 K Verification

1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification

08.0 DEMONSTRATE A WORKING KNOWLEDGE OF MICROPROCESSOR FUNDAMENTALS.

08.01 Explain fundamentals of microprocessor operation. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	08.02 Analyze & measure properties of analog & digital signals utilizing VOM, DVM & oscilloscope. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	08.03 Describe differences between analog & digital signals. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification
08.04 Explain types of memory(s). 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	08.05 Explain central processing unit operation. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	08.06 Describe function of clock generator. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification
08.07 Explain function of analog to digital & digital to analog convertors (interface). 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	08.08 Explain binary code. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	08.09 Explain pulse width modulation (duty cycle). 1 ☐ 2 ☐ 3 ☐ K ☐ Verification
08.10 Explain sensor information processing. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	08.11 Explain serial/parallel data processing. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	08.12 Describe function of multiplexing. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification
1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification
1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification

09.0 DEMONSTRATE A WORKING KNOWLEDGE OF ELECTRONIC ENGINE CONTROLS.

09.01 Describe stoichiometric air/fuel ratio. 1 2 3 K Verification	09.02 Describe computer control of air fuel ratio using concept of open loop/closed loop. 1 2 3 K Verification	09.03 Describe adaptive memory, integrator, block learn. 1 2 3 K Verification
09.04 Describe effect of air/fuel ratio, timing & exhaust gas recirculating system operation. 1 2 3 K Verification	09.05 Describe function of three-way catalyst. 1 2 3 K Verification	09.06 Describe methods of controlling air/fuel ratio. 1 2 3 K Verification
1 2 3 K Verification	1 2 3 K Verification	1 2 3 K Verification

10.0 DEMONSTRATE A WORKING KNOWLEDGE OF ELECTRONIC CONTROL MODULE INPUT AND OUTPUT DEVICES AND THEIR FUNCTIONS.

10.01 Demonstrate an understanding of the operation & use of dual trace oscilloscope. 1 2 3 K Verification	10.02 Describe temperature sensor operation. 1 2 3 K Verification	10.03 Describe manifold & barometric sensors operation. 1 2 3 K Verification
10.04 Describe exhaust gas oxygen sensor operation. 1 2 3 K Verification	10.05 Describe switch & timer circuit operation. 1 2 3 K Verification	10.06 Explain construction & operation of Hall effect switch. 1 2 3 K Verification
10.07 Perform testing of Hall effect switches. 1 2 3 K Verification	10.08 Describe engine speed sensor operation. 1 2 3 K Verification	10.09 Describe vehicle speed sensor(s) operation. 1 2 3 K Verification

10.10 Describe throttle position sensor operation. 1 2 3 K Verification	10.11 Perform testing of electronic timing controls including knock sensor. 1 2 3 K Verification	10.12 Utilize oscilloscope to test pick-up coil, Hall-effect switch, EST circuits, reference circuits. 1 2 3 K Verification
10.13 Describe detonation control (electronic spark control). 1 2 3 K Verification	10.14 Demonstrate an understanding of electronic spark timing operation. 1 2 3 K Verification	10.15 Describe mass airflow sensor operation. 1 2 3 K Verification
10.16 Describe electronic control module control of fuel evaporative system. 1 2 3 K Verification	10.17 Describe crankshaft position sensor operation. 1 2 3 K Verification	10.18 Describe electronic control module control of air-management system. 1 2 3 K Verification
10.19 Describe electronic control module control of early fuel evaporation (EFE). 1 2 3 K Verification	10.20 Describe electronic control module control of spark timing. 1 2 3 K Verification	10.21 Describe electronic control module control of carbureted fuel mixture. 1 2 3 K Verification
10.22 Describe types of fuel injection systems. 1 2 3 K Verification	10.23 Describe components of throttle-body injection systems. 1 2 3 K Verification	10.24 Describe components of port fuel injection systems. 1 2 3 K Verification
1 2 3 K Verification	1 2 3 K Verification	1 2 3 K Verification

11.0 DEMONSTRATE A WORKING KNOWLEDGE OF TROUBLESHOOTING ELECTRONIC CONTROL MODULE SYSTEMS.

11.01 Describe procedures for troubleshooting electronic control module systems. 1 2 3 K Verification	11.02 Describe type & use of trouble code(s). 1 2 3 K Verification	11.03 Demonstrate use of generic & manufacturers' test equipment. 1 2 3 K Verification

11.04 Describe difference between hard failure/soft failure. 1 2 3 K Verification	11.05 Perform trouble code retrieval procedures. 1 2 3 K Verification	11.06 Perform pin-out check on electronic control module input & output devices. 1 2 3 K Verification
11.07 Remove/replace electronic control module/calibration unit. 1 2 3 K Verification	11.08 Demonstrate ability to troubleshoot electronic control module systems utilizing manufacturers' diagnostic charts. 1 2 3 K Verification	11.09 Demonstrate general knowledge of electronic systems for major imports . 1 2 3 K Verification
1 2 3 K Verification	1 2 3 K Verification	1 2 3 K Verification

12.0 DEMONSTRATE A WORKING KNOWLEDGE OF SYSTEM OPERATION.

12.01 Explain the operation of computer shifted automatic transmission systems. 1 2 3 K Verification	12.02 Explain viscous converter clutch. 1 2 3 K Verification	12.03 Describe control module's effect on shifting patterns. 1 2 3 K Verification
12.04 Explain the function & operation of engine load sensors. 1 2 3 K Verification	1 2 3 K Verification	1 2 3 K Verification
1 2 3 K Verification	1 2 3 K Verification	1 2 3 K Verification
1 2 3 K Verification	1 2 3 K Verification	1 2 3 K Verification

13.0 DEMONSTRATE A WORKING KNOWLEDGE OF SYSTEM INPUT DEVICES.

13.01 Explain neutral safety/ backup light switch. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	13.02 Explain throttle position sensor (potentiometer). 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	13.03 Explain vehicle speed sensor. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification
13.04 Explain function of brake release switch. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	13.05 Explain engine coolant temperature sensor. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	13.06 Explain function of air conditioning pressure switches. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification
13.07 Explain cold inhibit switch. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	13.08 Explain operation of vacuum switches. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	13.09 Explain thermal vacuum valve. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification
13.10 Explain vacuum regulator valve. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	13.11 Explain vehicle speed sensor tripper module. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification
1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification

14.0 DEMONSTRATE A WORKING KNOWLEDGE OF SYSTEM OUTPUT DEVICES.

14.01 Explain operation of valve body/solenoid valve. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	14.02 Explain function of gear switches. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	14.03 Explain torque converter clutch apply valve. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification

14.04 Explain torque converter clutch delay valve. 1 2 3 K Verification	14.05 Explain engine coolant fan temperature switch. 1 2 3 K Verification	14.06 Explain governor pressure control switch. 1 2 3 K Verification
14.07 Explain function of pulse relay. 1 2 3 K Verification	1 2 3 K Verification	1 2 3 K Verification
1 2 3 K Verification	1 2 3 K Verification	1 2 3 K Verification

15.0 DEMONSTRATE A WORKING KNOWLEDGE OF SYSTEM DIAGNOSIS AND REPAIR.

15.01 Describe system check. 1 2 3 K Verification	15.02 Diagnose & differentiate between mechanical & electrical problems. 1 2 3 K Verification	15.03 Diagnose shifting problems related to engine performance. 1 2 3 K Verification
15.04 Identify driver habits effecting engine/ transmission related diagnosis. 1 2 3 K Verification	15.05 Describe stored code removal. 1 2 3 K Verification	1 2 3 K Verification
1 2 3 K Verification	1 2 3 K Verification	1 2 3 K Verification
1 2 3 K Verification	1 2 3 K Verification	1 2 3 K Verification

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16.0 DEMONSTRATE A WORKING KNOWLEDGE OF COMPUTER OUTPUT DISPLAYS.

16.01 Describe, diagnose & repair service engine lights/ emission lights. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	16.02 Describe, diagnose & replace liquid crystal displays. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	16.03 Describe, diagnose & replace vacuum tube fluorescent displays. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification
16.04 Describe, diagnose & repair/replace electronic speedometer system. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	16.05 Describe, diagnose & replace quartz-electric cluster. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	16.06 Describe, diagnose & replace digital cluster. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification
16.07 Describe, diagnose & repair/replace odometer. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification
1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification

17.0 DEMONSTRATE A WORKING KNOWLEDGE OF ELECTRONIC INSTRUMENTATION SYSTEMS.

17.01 Explain electronic instrumentation system operation. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	17.02 Diagnose & replace light emitting diode. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification
1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification

18.0 DEMONSTRATE A WORKING KNOWLEDGE OF THEFT DETERRENT SYSTEMS.

18.01 Describe theft deterrent system operation. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	18.02 Diagnose & repair the theft deterrent system. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification
1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification

19.0 DEMONSTRATE A WORKING KNOWLEDGE OF TRIP COMPUTER AND TRIP MONITOR SYSTEMS.

19.01 Describe trip computer & trip monitor operations. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	19.02 Diagnose & repair trip computer & trip monitor. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification
1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification

20.0 DEMONSTRATE A WORKING KNOWLEDGE OF WINDSHIELD WIPER AND WASHER SYSTEMS.

20.01 Describe windshield wiper & washer system operation. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	20.02 Diagnose & repair windshield wiper & washer system. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	20.03 Troubleshoot windshield wiper amplifier. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification

1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification

21.0 DEMONSTRATE A WORKING KNOWLEDGE OF CRUISE CONTROL SYSTEMS.

21.01 Describe cruise control operation. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	21.02 Diagnose & repair cruise control system. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification
1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification

22.0 DEMONSTRATE A WORKING KNOWLEDGE OF VOICE ALERT SYSTEMS.

22.01 Describe voice alert system operation. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	22.02 Diagnose & repair voice alert system. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	22.03 Perform on-car adjustment of voice alert system. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification
1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification
1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification

23.0 DEMONSTRATE A WORKING KNOWLEDGE OF AUDIO SYSTEMS.

23.01 Describe radio system operation. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	23.02 Diagnose & replace audio system components. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	23.03 Perform on-car adjustment of audio system. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification
1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification

24.0 DEMONSTRATE A WORKING KNOWLEDGE OF GUIDE-MATIC AND TWILIGHT SENTINEL SYSTEMS.

24.01 Describe the dimmer system operations. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	24.02 Diagnose & repair guide-matic & twilight sentinel systems. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	24.03 Perform on-car adjustment of guide-matic & twilight sentinel systems. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification
1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification

25.0 DEMONSTRATE A WORKING KNOWLEDGE OF CLIMATE CONTROL SYSTEMS.

25.01 Describe operation of climate control systems. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	25.02 Diagnose & repair climate control system. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	25.03 Perform on car adjustments of system. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification

AUTOTRONICS

1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification

26.0 DEMONSTRATE A WORKING KNOWLEDGE OF ELECTRONIC SEATS WITH MEMORY.

26.01 Describe operation of memory systems. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	26.02 Diagnose & repair electronic seats. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	26.03 Perform on car adjustments of system. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification
1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification

27.0 DEMONSTRATE A WORKING KNOWLEDGE OF FIBER OPTICS.

27.01 Theory of fiber optics. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	27.02 Application of fiber optics. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	27.03 Describe & identify fiber optic systems. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification
27.04 Diagnose & repair fiber optic systems. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification
1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification

28.0 DEMONSTRATE A WORKING KNOWLEDGE OF AUTOMATIC BRAKE SYSTEMS OPERATION.

28.01 Describe two-wheel & four-wheel anti-lock brake systems. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	28.02 Identify anti-lock brake system components, electrical circuits & controls. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	28.03 Explain brake modulation. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification
28.04 Explain built-in diagnosis on anti-lock brake system control module. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	28.05 Explain use & location of skid control sensor. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	28.06 Describe, diagnose & replace control module if equipped. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification
1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification

29.0 DEMONSTRATE A WORKING KNOWLEDGE OF ANTI-LOCK BRAKE SYSTEM DIAGNOSIS & REPAIR.

29.01 Perform basic diagnosis & testing using manufacturers' test equipment. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	29.02 Diagnose problems with master cylinder, hydraulic booster, electric pump accumulator & valve body assembly. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	29.03 Diagnose problems with fluid level warning switches. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification
29.04 Test electronic wheel sensors. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	29.05 Perform system self diagnostic test. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	29.06 Perform trouble code diagnostic procedures using manufacturers' diagnostic charts. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification
29.07 Perform pin-out checks. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	29.08 Describe, diagnose & replace control module if equipped. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification

1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification

30.0 DEMONSTRATE A WORKING KNOWLEDGE OF ELECTRONIC LEVEL CONTROL SYSTEMS.

30.01 Describe operation of electronic leveling control system. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	30.02 Demonstrate the correct vehicle raising & lowering operation. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	30.03 Explain the air replenishment system. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification
30.04 Describe a height adjuster sensor. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	30.05 Perform diagnostic procedures using manufacturers' diagnostic charts. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	30.06 Perform electrical circuit diagnosis. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification
30.07 Test system for correct performance. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	30.08 Test compressor operation. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	30.09 Test height sensor operation. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification
30.10 Test compressor current draw. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	30.11 Test residual pressure. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	30.12 Test system for air leaks. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification
30.13 Describe, diagnose & replace control module if equipped. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification
1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification

31.0 DEMONSTRATE A WORKING KNOWLEDGE OF ELECTRONIC STEERING SYSTEMS.

31.01 System operation. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	31.02 System diagnosis & repair. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification
1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification

32.0 DEMONSTRATE A WORKING KNOWLEDGE OF ELECTRONICALLY CONTROLLED CHARGING SYSTEM.

32.01 System operation. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	32.02 System diagnosis & repair. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification
1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification

33.0 DEMONSTRATE A WORKING KNOWLEDGE OF DRIVEABILITY LAB.

33.01 Demonstrate a knowledge of current technology in electronic engine control systems. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	33.02 Interpret vehicle identification numbers. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	33.03 Perform comprehensive engine performance analysis using oscilloscope & other appropriate equipment. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification

AUTOTRONICS

33.04 Perform a diagnostic circuit check of on-board microprocessor systems (self-test). 1 2 3 K Verification	33.05 Define & determine open & closed loop system operation. 1 2 3 K Verification	33.06 Explain & service an air injection system. 1 2 3 K Verification
33.07 Explain & service thermal systems. 1 2 3 K Verification	33.08 Explain & service charcoal canister purge systems. 1 2 3 K Verification	33.09 Service pollution control valve systems. 1 2 3 K Verification
33.10 Service exhaust gas-type fuel evaporative systems. 1 2 3 K Verification	33.11 Service electric type fuel evaporative systems. 1 2 3 K Verification	33.12 Explain, diagnose & demonstrate the servicing of the service exhaust gas recirculating systems. 1 2 3 K Verification
33.13 Test vacuum switch. 1 2 3 K Verification	33.14 Test solenoid operated vacuum switch. 1 2 3 K Verification	33.15 Service & repair engine cooling fan systems. 1 2 3 K Verification
33.16 Perform non-scan tool tests on inputs & controls of microprocessor systems. 1 2 3 K Verification	33.17 Perform scan tool diagnostics on inputs & controls of microprocessor systems. 1 2 3 K Verification	33.18 Test, service & repair microprocessor input sensors & control devices. 1 2 3 K Verification
33.19 Demonstrate the use of manufacturers' diagnostic charts. 1 2 3 K Verification	33.20 Perform system performance checks on electronic engine control systems. 1 2 3 K Verification	33.21 Diagnose cold driveability problems. 1 2 3 K Verification
33.22 Diagnose warm driveability problems. 1 2 3 K Verification	33.23 Perform sensor adjustment. 1 2 3 K Verification	33.24 Perform exhaust gas backpressure test. 1 2 3 K Verification
33.25 Check & reset ignition timing & idle speed settings as per vehicle emission control information label. 1 2 3 K Verification	33.26 Perform internal & external adjustments on electronic carburetors. 1 2 3 K Verification	33.27 Test & adjust minimum air flow. 1 2 3 K Verification

33.28 Analyze exhaust gases for proper emissions. 1 2 3 K — Verification	33.29 Test electronic idle air control. 1 2 3 K — Verification	33.30 Check idle stop solenoid. 1 2 3 K — Verification
33.31 Repair circuits with the use of wiring diagrams & component locator manuals. 1 2 3 K — Verification	33.32 Perform field repairs to wiring & connectors. 1 2 3 K — Verification	33.33 Test & service electronic ignition systems. 1 2 3 K — Verification
33.34 Test & service anti-detonation (knock sensor) devices. 1 2 3 K — Verification	33.35 Perform pin out tests & interpret readings. 1 2 3 K — Verification	33.36 Check engine vacuum systems for proper routing & connections. 1 2 3 K — Verification
33.37 Service air inlet systems. 1 2 3 K — Verification	33.38 Test and/or replace ignition coils. 1 2 3 K — Verification	33.39 Demonstrate the procedure for electronic control module, microprocessor, logic & power module replacement. 1 2 3 K — Verification
33.40 Perform diagnostic test on torque convertor clutch circuit & components. 1 2 3 K — Verification	33.41 Perform fuel pump pressure test on vehicles equipped with electronic fuel injection. 1 2 3 K — Verification	33.42 Test specific gravity of fuel, analyze & check for contaminants. 1 2 3 K — Verification
33.43 Perform fuel injector balance test on vehicles equipped with individual fuel injectors. 1 2 3 K — Verification	33.44 Perform fuel system diagnosis & performance checks. 1 2 3 K — Verification	33.45 Perform fuel pressure level tests. 1 2 3 K — Verification
33.46 Disassemble/reassemble throttle body unit. 1 2 3 K — Verification	33.47 Perform fuel injector cleaning procedures. 1 2 3 K — Verification	33.48 Test mass air flow sensor. 1 2 3 K — Verification
33.49 Remove, test, adjust and/or replace fuel injector. 1 2 3 K — Verification	33.50 Demonstrate understanding of system components. 1 2 3 K — Verification	33.51 Repair vehicles displaying various service codes as they would be encountered in a service situation. 1 2 3 K — Verification

0.0 DEMONSTRATE EMPLOYABILITY SKILLS.

0.01 Conduct a job search. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	0.02 Secure information about a job. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	0.03 Identify documents that may be required when applying for a job. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification
0.04 Complete a job application form correctly. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	0.05 Demonstrate competence in job interview techniques. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	0.06 Identify or demonstrate appropriate responses to criticism from employer, supervisor or other persons. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification
0.07 Identify acceptable work habits. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	0.08 Demonstrate knowledge of how to make job changes appropriately. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	0.09 Demonstrate acceptable employee health habits. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification

00.0 DEMONSTRATE AN UNDERSTANDING OF ENTREPRENEURSHIP.

00.01 Define entrepreneurship. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	00.02 Describe the importance of entrepreneurship to the American economy. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	00.03 List the advantages & disadvantages of business ownership. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification
00.04 Identify the risks involved in ownership of a business. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	00.05 Identify the necessary personal characteristics of a successful entrepreneur. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	00.06 Identify the business skills needed to operate a small business efficiently & effectively. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification
1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification

P.O.W.E.R. SKILLS (PRINCIPLES OF WORK ENVIRONMENT READINESS)

000.0 COOPERATIVE WORK EXPERIENCE COMPETENCIES.

1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification
1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification
1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification
1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification
1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification
1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification
1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification

VERIFICATION

The instructor should verify the level of mastery achieved by the student by initialing the competency box each time the student masters a competency. Later, if the student achieves a higher degree of mastery of a competency, the higher degree should be recorded and verified by the instructor.

INSTRUCTOR SHOULD SIGN FULL NAME AND SCHOOL NAME AND ADDRESS IN THE SPACE BELOW.

Verification	Signature
	Title
	School Name
	School Address

Verification	Signature
	Title
	School Name
	School Address

Verification	Signature
	Title
	School Name
	School Address

COOPERATIVE WORK EXPERIENCE

In addition to classroom training and laboratory performance identified on the Career MAP, this student has participated in cooperative work experience with employers as shown below:

Dates _____ Employer _____

Address of Employer _____

Supervisor _____

Supervisor Title _____

Dates _____ Employer _____

Address of Employer _____

Supervisor _____

Supervisor Title _____

Dates _____ Employer _____

Address of Employer _____

Supervisor _____

Supervisor Title _____

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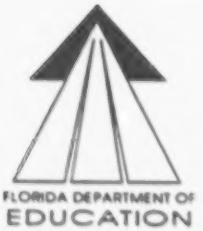
NOTES

This section of the MAP is provided so the instructor, employer, or student may list additional qualifying statements or other pertinent information. All comments should be initialed for verification.



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